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beneficial. In the former it will do no good whatever. This is mainly because in the former infection takes place probably by means of spores disseminated by the wind, so that whole fields soon become infected. It cannot be denied that an effectual remedy for wheat rust is still a great desideratum.

JOSEPH F. JAMES.

Washington, D. C., Aug. 5.

The Ancient Libyan Alphabet.

IN *Science*, July 15, Dr. Brinton has some remarks on this subject, which I have read with surprise. The old Libyan alphabet, he says, "appears to have been in common use among the Berber tribes of north Africa long before the foundation of Carthage (1), . . . and in its forms is almost entirely independent of the Phœnician letters (2). It is composed of consonants called *tifinar* (3), and vowel-points, known as *tidebakin*. The latter are simple dots (4), the former are the lines of a rectangle, more or less complete (5). Several of them are found in the oldest Etruscan inscriptions (6). . . . The writers who have given especial attention to this little-known subject are Faidherbe, Duveyrier, Halévy, Bissuel, and, recently, Dr. Collignon (7)."

To avoid repetition, and facilitate reference, I have numbered the points in this passage on which I should like to offer a few observations.

1 and 2. What authority has Dr. Brinton for referring this alphabet to pre-Carthagenian times, and for stating that its forms are almost entirely non-Phœnician? I have hitherto regarded the Punic origin of the Libyan letters as an established fact accepted by all epigraphists of weight, and notably by Mommsen, who unhesitatingly recognizes their Semitic descent: "The Libyan or Numidian alphabet now as formerly in use amongst the Berbers in writing their non-Semitic language is one of the innumerable offshoots of the primitive Aramæan type. In some of its details it seems even to approach that type more closely than does the Phœnician itself. We are not, however, therefore to conclude that the Libyans received it from immigrants older than the Phœnicians. It is here as in Italy, where certain obviously more archaic forms do not prevent the local alphabet from being referred to Greek types. All that can be inferred is that the Libyan alphabet belongs to the Phœnician writing older than the epoch when were composed the Phœnician inscriptions that have survived to our time" (*History of Rome*, iii., 1).

It follows that the Numidian ancestors of the Berbers received their writing system from the Carthaginians, earliest Phœnician settlers on the north African sea-board, and, consequently, that the Libyan alphabet had no currency "long before the foundation of Carthage." The archaic forms referred to by Mommsen were the forms in use in Tyre and Sidon in pre-historic times, whereas the extant Phœnician inscriptions date from historic times; hence the discrepancies between the latter and those preserved by the Berbers, most conservative of all peoples.

3. Not the consonants alone, but the whole system (mainly, of course, consonantal as being Semitic) is called "*tifinar*," or rather "*tifnagh*." The sounds *gh* and *rh* interchange in the Libyan dialects (*Ghet* and *Rhet*; *Melghigh* and *Melrhurh*, etc.), so that it is not always easy to decide which is the original sound. But here there is no doubt that *gh* is organic; and Barth, for instance, always writes *Tefnagh*, plural *Tefnaghen*: "There was in particular a man of the name of Sâma, who was very friendly with me. On reading with him some writing in *Tefnaghen*, or the native Berber character, I became aware that this word signifies nothing more than tokens or alphabet. For as soon as the people beheld my books, and observed that they all consisted of letters, they exclaimed repeatedly, 'Tefnaghen — ay — Tefnaghen!'" (*Travels*, V., p. 116). There is, however, more in this word than Barth was aware of. When stripped of the common Berber prefix *te*, it reveals the "*Finagh*," i.e., "Phœnician," or "Punic" origin of the letters in their very name. Note the stress still falling on the root *fin*, as in *Pœni*.

4. F. W. Newman explains *Tidebâkka* (pl. *Tidebâkken*) to mean "a dot on or under the letter" (*Vocab.*), in fact any diacritical mark of the kind, and not merely vowel signs. Some, however,

are doubtless used to voice the consonants, as in Hebrew. Like other Semitic alphabets, Tefnagh had originally no vowels, but only three breathings, transformed in some systems (Greek, Italic) to pure vowels, in others (Cufic, Arabic) to semi-vowels and vocalic bases. But all this merely tends to strengthen the view that the Libyan is a Semitic alphabet.

5. This statement is to me unintelligible. In the published Libyan alphabets (Fr. Ballhorn, "Alphabete orientalischer und occidentalischer Sprachen," p. 8; Hanoteau, "Essai de grammaire de la langue tamachek," and others) curves occur quite as frequently as straight lines, while acute decidedly prevail over right-angles. Of the eight letters copied by Barth (I., p. 274) two only can be described as "more or less complete rectangles," forms which are certainly less common than, for instance, in Hebrew and Estranghelo.

6. It would be strange if resemblances did not occur between the Libyan and the characters of "the oldest Etruscan inscriptions," seeing that both have a common Semitic origin, the former directly through the Phœnician, the latter indirectly through the archaic Greek. But such resemblances obviously lend no color to Dr. Brinton's peculiar views regarding Libyco-Etruscan linguistic affinities.

7. Of the writers here referred to, Faidherbe and Halévy alone can be regarded as specialists. On the other hand, there are serious omissions, such as Dr. Oudney, who in 1822 first discovered the existence of the Berber alphabet; F. W. Newman, "Patriarch of Berber philology;" Mommsen and Hanoteau, as above; lastly, A. Judas, who was the first to clearly establish the Phœnician origin of these characters in a paper entitled "De l'écriture libyco-berber," contributed to the *Revue Archéologique* for September 1862.

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BOOK-REVIEWS.

Handbook for the Department of Geology in the U. S. National Museum. Part I. Geognosy.—The Materials of the Earth's Crust. By GEORGE P. MERRILL. Washington, Government Printing Office, 1892. 89 p. 12 pl.

THE U. S. National Museum is probably the greatest institution of its kind in this country. The museums located in New York, Cambridge, Boston, Philadelphia, and other large cities present to the residents of those places and to students many facilities for study. This is particularly the case with the American Museum of Natural History in New York and the Museum of Comparative Zoology in Cambridge. But neither one of these has been planned upon so extensive a scale, or is destined to attain such mammoth proportions, as the National Museum at Washington. The country at large is familiar with some things to be found at the museum from the numerous expositions at which displays of its treasures have been made; but no one who has not visited and lingered long in its great but crowded quarters at the National Capital can adequately realize the broad foundation upon which it is based, or the immense variety and scope of its collections. There are gathered together here materials which cover all human arts and all the natural sciences—anthropology in its widest sense, from the rude, chipped-flint implement of palæolithic man to the delicate *Sevres* china of civilized man; rocks and fossils from the most ancient formations to the most recent; animal forms from the minutest insect that flies to the hugest creature of land or sea. Scarcely an object, indeed, in which man has had aught to do, or to find interest in, but is to be found here.

The collections are not, either, lying idle. A large corps of curators is constantly at work, either arranging the old collections or studying and comparing the new. The results of these studies appear from time to time in the *Proceedings of the Museum*—a publication scarcely known to the public at large even by title, on account of its limited circulation—or else in the *Annual Reports of the Museum*, which are more widely known from being distributed as congressional documents. Unfortunately, these last usually appear from two to three years after the date they are stated to be reports for.

In the early days, when the Smithsonian Institution was the

repository for the national collections, these reports touched but lightly upon the vast amount of material stored away. Within the past five years, however, and since the National Museum has become recognized as the place where all government expeditions shall deposit the material collected by them, a large volume has been annually devoted to this branch alone. Those which have been issued are filled with information upon a great variety of subjects, although special attention seems to have been devoted to ethnology. Naturally, other matters are treated of, and it is likely that, in the future, place will be given to all departments as fast as the several curators find time or see fit to devote their attention to making the collections under their charge known to the outside world.

The article under review, for it is merely an excerpt issued under a separate cover from the Report of the Museum for 1890, and covering pages 503-591 of that report, is one which, while designed to be a handbook for the collections, is in reality a condensed account of the rocks forming the earth's crust. In it one will find concise descriptions of the sixteen principal elements that go to make up rock masses; a list of the original and secondary minerals of these rocks; an account of the macroscopic and microscopic structure of rocks; the chemical composition (in brief) and the color. The most extensive portion of the handbook, however, is that which deals with the kinds of rocks. Under this head we have described the four varieties of (1) *aqueous*, those formed through the agency of water either as chemical precipitates or as sediments; (2) *æolian*, those formed from wind-drifted materials; (3) *metamorphic*, those changed by dynamical or chemical agents from an original aqueous or igneous origin; and (4) *igneous* (eruptive), those brought up from beneath the surface in a molten condition. It is not necessary to go into details as to all these classes, or to mention the various divisions made of them; an extract or two will serve to show the character of the remarks. For example, under Chlorides we read:—

"Sodium chloride, or common salt, is one of the most common constituents of the earth's crust. From an economic standpoint it is also a most important constituent. It occurs in greater or less abundance in all natural waters, and, as a product of evaporation of ancient seas and lakes, it occurs in beds of varying extent and thickness among rocks of all ages wherever suitable circumstances have existed for their formation and preservation. Salt-beds from upwards of a few inches to thirty feet in thickness occur in New York State and Canada, while others abound in Pennsylvania, Virginia, Ohio, Michigan, and Louisiana. There are also numerous surface deposits, of great extent, in the arid regions of the West" (p. 533).

Under the head of *Siliceous group*, infusorial or diatomaceous earth, we find the following:—

"This is a fine white or pulverulent rock composed mainly of the minute shells, or tests, of diatoms, and often so soft and friable as to crumble readily between the thumb and finger. It occurs in beds which, when compared with other rocks of the earth's crust, are of comparatively insignificant proportions, but which are nevertheless of considerable geological importance. Though deposits of this material are still forming, e.g., in the marshes of Yellowstone Park, and have been formed in times past at various periods of the earth's history, they appear most abundantly associated with rocks belonging to the Tertiary formations.

"The celebrated Bohemian deposit is some fourteen feet in thickness, and is estimated by Ehrenberg to contain 40,000,000 shells to every cubic inch. The Australian specimen exhibited is from a deposit four feet in thickness. In the United States, beds are known at Lake Umbagog, New Hampshire; Morris County, New Jersey; near Richmond, Virginia; Calvert and Charles Counties, Maryland; in New Mexico; Graham County, Arizona; Nevada; California; and Oregon. The New Jersey deposit covers about three acres, and varies from one to three feet in thickness; the Richmond bed extends from Herring Bay, on the Chesapeake, to Petersburg, Virginia, and is in some places 30 feet in thickness; the New Mexico deposit is some six feet in thickness and has been traced some 1,500 feet; Professor LeConte states that near Monterey, in California, is a bed some 50 feet in thickness; while the geologists of the fortieth-parallel survey report beds not less than

300 feet in thickness of a pure white, palebuff, or canary-yellow color as occurring near Hunter's Station, west of Reno, Nevada.

"The earth is used mainly as a polishing powder, and is sometimes designated as *tripolite*. It has also been used to some extent to mix with nitro-glycerine in the manufacture of dynamite. Chemically the rock is impure opal" (p. 540).

It is in such books as these that the young student finds his best helps. The information given is accurate; the paths are made pleasant; the rough places are smoothed. It is greatly to be desired that the other departments of the Museum may have as useful descriptions of their contents. JOSEPH F. JAMES.

Washington, D.C., Aug. 8.

Phases of Animal Life, Past and Present. By R. LYDEKKER. London. Longmans, Green & Co. 8°. \$1.50.

THIS admirable series of essays, which was originally published in *Knowledge*, has been reprinted in an attractive form both as regards typography and illustrations. The essays are concisely written, and reveal a wealth of knowledge on the part of the author. The explanations of scientific discoveries and conclusions are neither too elementary nor too technical, and the essays will be read with pleasure as well as profit by anyone interested in zoological lore.

The earlier and the closing chapters of the book are devoted to the consideration of various morphological adaptations, such as protective armor, the modifications of limbs for flying and swimming, and the forms of teeth and horns. The author then takes up the fossil reptiles, describing the characteristics of the ichthyosaurs, plesiosaurs, and dinosaurs, and explaining the differences between them. Other chapters relate to the tortoises, the extinct gigantic birds, the egg-laying and marsupial mammals, and other animals whose structure and history are of special interest. There is for the most part no close connection between the various topics, but they are all important and worthy of attention.

In the treatment of morphological subjects Mr. Lydekker makes use of certain metaphorical expressions which may possibly mislead the unwary reader. Various modifications are spoken of as if they resulted from the conscious, intelligent action of the animals concerned. It is stated, for example, that the ancient mail-clad fishes "appear to have come to the same conclusion as the more advanced divisions of the human race, that a massive armor for the protection of the body is an encumbrance" (p. 7). Again, the reptiles "held divided opinions as to whether a bony coat of mail was or was not a thing to be retained as a permanency." Such expressions are calculated to induce a wrong way of looking at things unless, indeed, the Lamarckian idea that modifications result directly from the efforts of organisms is to be accepted.

One is surprised to find in the writings of so good a naturalist as Mr. Lydekker the statement, or insinuation, that the separation of the amphibians from the reptiles is due to "that tendency to multiply terms for which they (the naturalists) are so celebrated" (p. 8). Mr. Lydekker, of course, well knows and, indeed, takes pains to explain, that the separation was made on account of the fact that the typical representatives, at least, of these two groups are very different both in structure and mode of development. There have undoubtedly been many instances in which naturalists have coined new names unnecessarily, but this is certainly not a case in point.

These are small defects, however, and are entirely overbalanced by the excellencies of the book. It deserves and will repay perusal.

AMONG THE PUBLISHERS.

"THE Delaware Indian as an Artist" is the subject of a fully illustrated paper by Dr. Charles C. Abbott, to appear in *The Popular Science Monthly* for September. The objects of art which are represented include carved-stone gorgets, a wooden spoon-handle, wooden masks, and other carvings, many of them showing much skill. Professor J. S. Kingsley will describe "The Marine Biological Laboratory at Wood's Holl," giving pictures of its building and interior arrangements. Something is told also of its neighbor, the laboratory of the United States Fish Commission. Surgeon George M. Sternberg, U.S.A., will have a paper on "In-